Khanyisa IPP—a 450-MW$_e$ CFB project: Practical challenges

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Abstract—Anglo American has commenced a commercial procurement process for delivery of a 450-MW power plant fuelled by discard coal in the Emalahleni area of Mpumalanga, South Africa. The proposed IPP will utilize circulating fluidized-bed technology and be supplied by Anglo American’s Thermal Coal (AATC) business unit. All electrical power will be purchased by Anglo American’s Platinum (AAP) division through a 25-year PPA and will be delivered to a number of its operations via the Eskom network.

In order to ensure competitive bidding, “off-the-shelf” technology has been specified, with the minimum functional specification calling for three 150-MW units and dry cooling. Nevertheless, a number of other challenges to implementing a CFB power project in South Africa were encountered. They include—

- A strategic rationale and appropriate structure, given that Anglo American is a resource company
- A lack of power-industry experience by the project sponsor
- Regulatory issues related to third-party use of the transmission network
- An appropriate site selection
- Securing of long-term access to fuel
- Coal-preparation requirements
- The impact of the South African Integrated Resource Plan

The paper examines some of these challenges and outlines steps taken to resolving them.

CONTEXT AND RATIONALE

There was time in South Africa when electricity was cheap and there for the taking. Those days are coming to an end. The utility supplier Eskom, by its own admission, is “managing a tight power system”. What does this mean? In 16 weeks of the first five months of 2011 Eskom had “adequate operating reserves” of power, defined as 1600–1900 MW, which equates to a reserve margin of 15%. There was a low-level shortfall (up to 1000 MW below adequate) in five weeks of this period, four of them in May. The months following this period would have seen more weeks of shortfall, as demand is always higher in the winter months. Eskom estimates that the shortfall in supply for 2011 will reach 6 TWh, and if the initiatives underway to reduce the shortfall materialize, this “gap” between supply and demand will continue until 2015. The utility supplier is addressing circumstances in three ways. First, it is pushing to improve “energy efficiency”; secondly, it is working to reduce demand; and thirdly, it is supporting initiatives to increase supply—in other words, to build power plants. Eskom has signed up 373 MW in its medium-term power-purchase programme (MTPPP) and has contracted about 515 MW of municipal generation. More significantly, though, it is supporting the construction of six new power stations. They are, along with the years in which they come on line, Grootvlei and Komati (2010/11), Arnot (2011/12), Medupi (2013/14), Ingula (2013/14) and Kusile (2014/15). Each power station will bring further capacity in the next five years, and by 2020 the “new-build” programme should see an additional installed capacity of 12.1 GW (see Figure 1). Finally, in working to provide an adequate margin of reserve (of 15%), Eskom is counting on
the capacity that independent power producers (IPP) are expected to supply in the coming years.

The current and medium-term shortage in power and its consequences (power interruptions) for industry are one of the major risks that many operations, including Anglo American, face. Another risk is the price of electricity, which is expected to rise significantly in the near future. That conclusion was drawn in an assessment that assumed “an extremely conservative” projected price. The conservative prediction took values that were lower than the “likeliest projected prices” of Eskom and far lower than the “projected medium-term price” expected by Anglo American. Anglo American, moreover, expects further increases in price after 2025, when Eskom needs to replace or refurbish some of its existing plants, including replacing them with alternative energy-fuelled plants. Higher costs for power will cut into profits and undermine the viability of some industrial operations.

These projections and risks are inescapable circumstances for Anglo American’s platinum operations (AAP), located in two provinces, North West and Limpopo. These operations, which involve smelters, are energy intensive. How can these risks be mitigated? South Africa is a coal-rich country, and the fossil fuel has been mined for over 100 years. Beneficiation produces a fraction of lower quality that reports to tailings, which are discarded in dumps. The discard coal in these dumps now total many millions of tonnes. Anglo American’s Thermal Coal division (AATC) adds to and owns several of these dumps. A few years ago it commissioned a study to assess the opportunity of unlocking the value in discard coal to reduce the dependency on Eskom of Anglo American’s operations. The study examined five options and evaluated the risks associated with five key variables in constructing its own power plant — five key “drivers of risk” — namely, the cost of construction, the price of power, the availability of the plant, the rate of exchange, and inflation. It concluded that AATC could create value for the organization exploiting discard coal to produce energy, and that it could do it in one of three ways (from highest to lowest value options) —

- By direct ownership. Anglo American would own the plant in its entirety, but outsource the operation to a service partner.
- By a tolling agreement with a power-plant developer. Anglo American would pay a tolling fee that covers the CAPEX and OPEX of the tolling partner, an arrangement similar to one termed “cost plus”. Anglo American would decide when the plant runs and whether to consume or trade the power produced.

Figure 1. Eskom’s new-build programme

![Figure 1. Eskom’s new-build programme](image-url)
• Through an IPP model. Anglo American would enter into a contract with an IPP to sell discard coal and buy power. It would fix a long-term agreement on the prices of fuel and power.

This paper describes the option taken to realize value and mitigate risk for Anglo American. It also outlines the particular challenges encountered—challenges that are more commercial than technical and some particularly applicable to South Africa.

STRUCTURES

The power plant

The power plant at the heart of Khanyisa IPP comprises three 150-MW_e circulating fluidized bed (CFB) boilers, each with their own turbine-generator set. The choice of boiler rested on the flexibility of CFBs. Appropriately designed, they can burn fuels spanning a range of qualities. At the low-grade end they can handle fuels with low heating values (>6 MJ/kg), high moisture content (<55%), and high ash content (<60%). High-ash discard coals are generally cheaper than fuels of better quality, so the technology carries a cost benefit. Pollutant emissions from CFB boilers are inherently lower than those from the competing technology, pulverized-fuel (PF) boilers. Because the combustion temperature in CFBs (840–900°C) is much lower than that of PF boilers (1350–1500°C), less NOx forms (from nitrogen in the fuel and the air); and by injecting limestone (calcium carbonate, a sorbent) into the furnace, one can capture SO2 without resorting to an expensive SO2-removal system. There are further savings in not having to pulverize the coal; CFB boilers can handle a top size of 12 mm.

Two choices for the Khanyisa IPP were constrained by considerations beyond the technology itself. First, there is the primary question of capacity, that of the power plant and the size and number of CFB units. The capacity (which translate to “footprint”) was determined by the area of land not undermined—an available area of ±30 ha—and by the base-load consumption of AAP, which is ±430 MW needed 95% of the time. These factors capped the capacity of the power plant at 450 MW_e. The number and the size of units were determined by two requirements, reliability and redundancy. The implications of both requirements were compared in two scenarios. In one of the scenarios the power plant runs two CFB boilers, each of 225 MW_e. In the other, the plant runs three CFB boilers, each of 150 MW_e. When one of the units is down for maintenance AAP would need to make up the shortfall from Eskom. It will be easier for Eskom to supply 150 MW (a third of Khanyisa IPP capacity) than 225 MW (half of capacity not generated). The 150 MW unit size is also more widely available, which would enable several potential suppliers and a more competitive bidding process.

The other choice sets the design of the plant somewhat apart from some power plants of this kind. Because limestone is more expensive than fuel in the Khanyisa IPP, the coal will be beneficiated in order to use (inject) less sorbent in the furnaces of the boilers to capture SO2. The consequences are that two further plants will be built, a wash plant for beneficiating the discard coal, and potentially an FGD plant for scrubbing SO2 emissions from the off-gas.

The power plant will be built close to sources of fuel, huge dumps of discard coal. AATC manages several collieries in the Witbank area in Mpumalanga Province. Pre-feasibility studies in the project identified six potential sites in an area about 10 km south of Witbank. Three mines operate in the area; on an axis running from north-west to south-east, they are Landau Colliery, Greenside Colliery and Kleinkopje Colliery. Four main dumps receive discard coal from these mines (see Table 1). The power plant will be located on a site in the vicinity of Kleinkopje Colliery and its dump, called Klippan. The coal will be transported from the dump to a new modular wash plant, called Klippan wash plant, and from there to the power plant (~2 km), all of it by conveyer belt. Choosing an appropriate site for the power station presented challenges to the project team. These are discussed in a subsequent section. Challenges aside, however, two overriding considerations informed location; they are the proximity of the plant (1) to sources of fuel and (2) to a source of water.4

The power plant will lie about 4 km from the eMalahleni Water Reclamation Plant, which treats the mine water from four collieries, three of them run by AATC (Landau, Kleinkopje and Greenside), a fourth owned by BHP Billiton (South Witbank). The plant recovers 99.5% of water treated, producing in a day 30 million litres of potable water (TDS <100 mg/L, the SABS 241
class-0 standard for municipal water).\textsuperscript{4,5} It discards 240 tonnes of solid waste (CaSO\textsubscript{4}·2H\textsubscript{2}O [gypsum]) and 160,000 L of brine a day.\textsuperscript{5} Water serves one purpose at the power plant: from it steam is produced.\textsuperscript{4} The only treatment of water at the power plant is “demineralization”—fine particulates and dissolved salts are removed with ion-exchange technology.\textsuperscript{4}

Table 1. The sufficiency of discard coal

<table>
<thead>
<tr>
<th>Dump</th>
<th>CV* MJ/kg</th>
<th>Ash*</th>
<th>Moist.*</th>
<th>Sulfur*</th>
<th>VM*</th>
<th>FC*</th>
<th>Existing 2011</th>
<th>Arising 2012–25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landau 3/Klipfontein</td>
<td>17.5</td>
<td>39.8</td>
<td>3.0</td>
<td>3.2</td>
<td>20.2</td>
<td>41.3</td>
<td>16.0</td>
<td>–</td>
</tr>
<tr>
<td>Kleinkopje</td>
<td>14.3</td>
<td>43.9</td>
<td>2.2</td>
<td>2.2</td>
<td>18.1</td>
<td>35.8</td>
<td>45.0</td>
<td>74.2</td>
</tr>
<tr>
<td>Greenside</td>
<td>15.2</td>
<td>46.4</td>
<td>2.0</td>
<td>3.1</td>
<td>17.9</td>
<td>33.5</td>
<td>42.6</td>
<td>51.8</td>
</tr>
<tr>
<td>Blaauwkrans (co-disposal)</td>
<td>11.5</td>
<td>57.97</td>
<td>2.1</td>
<td>2.4</td>
<td>13.7</td>
<td>26.4</td>
<td>33.4</td>
<td>12.6</td>
</tr>
<tr>
<td>Total</td>
<td>136.9</td>
<td>138.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Qualities are indicative. CV = calorific value, VM = volatile matter, FC = fixed carbon

Compared with a typical South African thermal coal exported to Europe (Bell, pers. comm.), the discard coal, not surprisingly, is of an inferior quality (see Table 2). It has only half the calorific value; it contains more than 50% ash and up to four times as much sulfur (2.0±1.1% S). There is half as much carbon, less volatile matter, and five times more chlorine. It contains half as much nitrogen. Ash compositions are comparable. The ash is, by and large, alumina silicate; it contains more iron oxide and less calcium oxide. Ash fusion temperatures of discard coal are about 35–65°C higher than those of export thermal coal (see Figure 2).

Table 2. Analyses and properties of export and discard coals

<table>
<thead>
<tr>
<th>Analysis/property</th>
<th>Discard coal, Klippan dump</th>
<th>SA export thermal coal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average 2s ‡ Min.–max. ‡</td>
<td>Typical Ship range</td>
</tr>
<tr>
<td>Calorific value (gross, ad†—MJ/kg)</td>
<td>12.3 1.5 10.9–14.4</td>
<td>27.40 27.00–27.46</td>
</tr>
<tr>
<td>Total moisture (%)</td>
<td>1.8 0.4 1.2–2.2</td>
<td>8.0 6.8–8.8</td>
</tr>
<tr>
<td>Hardgrove Index</td>
<td>70 6 65–77</td>
<td>53 51–56</td>
</tr>
<tr>
<td>Ash analysis (dry ash, %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SiO\textsubscript{2}</td>
<td>53 10 32–58</td>
<td>50 –</td>
</tr>
<tr>
<td>Al\textsubscript{2}O\textsubscript{3}</td>
<td>27 3 21–29</td>
<td>31 –</td>
</tr>
<tr>
<td>Fe\textsubscript{2}O\textsubscript{3}</td>
<td>7.3 3.0 2.4–10.2</td>
<td>3.5 –</td>
</tr>
<tr>
<td>CaO</td>
<td>4.8 8.4 2.8–26.2</td>
<td>8.2 –</td>
</tr>
<tr>
<td>SO\textsubscript{3}</td>
<td>2.6 1.9 1.1–5.0</td>
<td>2.1 –</td>
</tr>
<tr>
<td>P\textsubscript{2}O\textsubscript{5}</td>
<td>0.7 1.8 0.3–4.3</td>
<td>2.3 –</td>
</tr>
<tr>
<td>Proximate analysis (ad† – %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inherent moisture</td>
<td>1.8 0.4 1.2–2.2</td>
<td>2.7 2.5–3.1</td>
</tr>
<tr>
<td>Volatile matter</td>
<td>16 1.6 13.5–17.5</td>
<td>24.2 22.7–26.2</td>
</tr>
<tr>
<td>Ash content</td>
<td>54 3.8 48.8–57.0</td>
<td>15.0 12.4–16.0</td>
</tr>
<tr>
<td>Fixed carbon</td>
<td>29 3.0 26.3–33.3</td>
<td>57.9 55.5–58.1</td>
</tr>
<tr>
<td>Ultimate analysis, partial (dry basis, %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon</td>
<td>34 3.0 30.8–38.7</td>
<td>72.0 –</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>2.2 0.3 1.9–2.5</td>
<td>3.8 –</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>0.8 0.5 0.6–2.3</td>
<td>1.7 –</td>
</tr>
</tbody>
</table>
Table 2—continued

<table>
<thead>
<tr>
<th>Sulfur and halides (%)</th>
<th>2.0</th>
<th>1.1</th>
<th>0.4–3.0</th>
<th>0.54</th>
<th>0.50–0.67</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorine</td>
<td>0.021</td>
<td>0.015</td>
<td>0.016–0.063</td>
<td>0.004</td>
<td>—</td>
</tr>
<tr>
<td>Fluorine</td>
<td>0.036</td>
<td>0.021</td>
<td>0.022–0.060</td>
<td>0.020</td>
<td>—</td>
</tr>
</tbody>
</table>

† air dried. ‡ 2s = two standard deviations of the statistical sample; the “min.–max.” identifies the minimum and maximum values in the statistical sample. The export coal is finer than 50 mm.

The power plant will receive discard coal from the Klippan wash plant by conveyor and water from the eMalahleni Water Reclamation Plant. The plant will adopt Eskom’s position, that all power stations discharge no waste effluent: all water entering the plant will be contained and used; there will be no discharge. Ash is another matter. There is a great deal of it, and it needs to be discarded in a way that does not harm the environment. The discarded product will be a mix of fly ash, un-reacted limestone and CaSO₄. It will be transported in a piped conveyor to a disposal site, an old open-cast pit that has been backfilled and rehabilitated south-west of the power station. This site will be permitted as a waste-disposal facility and be engineered with a double lining, provision for runoff water, and appropriate rehabilitation plan.

![Figure 2. Ash-fusion temperatures](image)

Average values of the AFTs of 37 samples of drill cores through the Klippan dump are plotted; the bars indicate two standard deviations of the statistical sample. AFTs of the thermal coal (Anglo American) are typical values for the period January–May 2011 (Bell, pers. comm.); the bars indicate the “ship range”.

Electrical connections

The significant connection is an electrical one to the national grid. At full capacity the plant will generate 450 MWₑ. All power generated will be transmitted via the 400-kV transmission network (Eskom). The connection to the grid will include a new sub-station near the power plant and two 400 kV power lines that will extend ±3km north-east of the power-station site and into the national grid.
The deal

As Anglo American is a resource company and not a power generation company, it opted for the IPP model. Anglo American has only to supply coal and water and to buy the power. The structure of the deal is such that Anglo American sits on both sides of the transaction (see Figure 3). AATC supplies coal and water to the IPP (the left-hand side of the diagram). The IPP will enter into its own agreements with third parties, one for operation and maintenance (O&M), the other for limestone. In order to connect the power station to the grid the IPP will enter into a transmission agreement with Eskom. AAP will buy power from the IPP (the right hand side of the diagram) through a power purchase agreement (PPA). It will also have an own-generation and use-of-system agreement with Eskom in order to use the network and to be allowed to take electricity off at the various load points.

![Figure 3. The deal: Anglo American’s obligations are to take power and provide discard coal](image)

CHALLENGES

Locating an acceptable site

Besides securing long-term access to fuel and water, the power plant and its location must meet criteria that address geotechnical, social and environmental requirements. One of these is the condition of ground stability upon which the plant will be built. The ground must be geologically stable. If there are mines in the vicinity, they should not pass under the proposed site, nor should the area have been previously undermined. The exclusion applies also to future mining activity in the area. Geotechnical studies have found the ground under the proposed site to be stable, not to be undermined previously, and the risk of subsidence, therefore, low. There is sufficient distance between the power plant and underground workings.4

Another criterion is the road infrastructure in the area. The N12 motorway passes just north of the proposed site. It will allow heavy equipment to be transported to the site. A provincial road currently passes over the site. It will be diverted, as will two distribution power lines, 22 kV each, and a fresh water pipeline that services Kleinkopje colliery. The access road to the site will need to be upgraded. With proper planning, these changes are readily effected.

A more difficult action to undertake would be the moving of graves in the area. A total of 118 graves are located under a 400-kV power line. Rather than move a number of graves and a 400kV power line on the southern boundary of the site, developers will fence off this area and respect the graveyard, as well as the servitude to Eskom’s power line. The moving of graves is a specialist matter that requires well-defined statutory procedures be followed. Nevertheless, in this instance, it was possible to avoid disturbing the area by altering slightly the layout of the facility.
Judged by these criteria, which by no means complete the set, the viabilities of all of the potential sites considered in the pre-feasibility study were “practically the same”. The proposed site has the advantage of being closest to the mines (arising discards) and priority dumps (existing discards); furthermore, there are no plans to mine under the site.

Who lives longer? Mine versus project

The life of the power station is expected to be 40 years: the term of the Power Purchase Agreement (PPA) is 25 years, with a potential to extend it for another 15 years. The PPA is scheduled to start in 2016. During the life of the PPA the Life of Mine (LOM) of the collieries in the area would have been reached (within the 2020s). The IPP, therefore, is expected to outlive the mines. More than 60% of the fuel for Khanyisa IPP will come from the Klippan dump (Kleinkopje’s discard dump facility). It will need to secure the access to this fuel. Security will be achieved by Anglo American retaining the mining right over the Klippan dump, thereby securing its access to reclaim the discards.

How to control sulfur emissions

Discard coal from dumps in the area have two properties that disqualify it from conventional PF boilers, but not from CFB boilers. Despite a low calorific value and a high ash content (see Table 1), the coal burns and releases energy, from which power can be generated. A third property is also readily accommodated in CFB boilers. The discard coal contains high levels of sulfur (see Table 1). In CFB boilers sulfur is absorbed by limestone, a sorbent injected into the furnace (Limestone is injected for fuels with more than 0.5% sulfur.). Limestone, in this instance, costs ten times as much as discard coal; three quarter of that cost covers transport of the limestone from the quarries to the Witbank area. To reduce the amount of sulfur in the feed to the boilers, the discard coal will be beneficiated (in a wash plant). This will, in turn, reduce operating costs. Beneficiation will also provide a stream of coal of constant quality.

Khanyisa will comply with the emission standards of the World Bank IFC (International Finance Corporation).

Tariff structure and capacity charge

The tariff has been set up in order to keep the IPP whole (i.e., it recovers its costs under most conditions, save its own default). The main component of the tariff is the capacity charge, which will initially make up around 70% of the tariff. The capacity charge arises because the sole purpose of Khanyisa IPP is to provide power to AAP; the developer cannot recover its capital costs from any other user. If AAP cannot take power on a certain day (or days), yet the IPP is available to generate electricity, then AAP will be obligated to pay a capacity charge for the current available energy capacity. This will allow the IPP to continue repaying its debt. Without the capacity charge the IPP would not be able to raise any finance. The other IPP costs in the tariff (i.e., coal, limestone, water, fixed and variable O&M) are also identified in the tariff and will be passed through to AAP.

Finance lease

As AAP will be the only off-taker of power from Khanyisa IPP, it will be liable to pay for all the electricity generated. By signing the PPA, AAP is committing to buy the power from the IPP and, in particular, the capacity charge for the next 25 years. This condition makes the PPA a liability on AAP’s balance sheet. The liability amounts to the total cost of the IPP (about US$1bn). A finance lease of this magnitude could impact on the covenant ratios of AAP. The project team examined the impact of the finance lease on AAP’s balance sheet. The covenant ratios (i.e., gearing and EBIDTA interest cover) are expected to be maintained within the company’s targets.

Carbon footprint

Given that Khanyisa IPP will burn discard coal, its carbon footprint is likely to be slightly higher than that of Eskom—because Eskom’s generation mix includes nuclear and hydro besides coal. As less carbon-intensive sources of generation are added to the Eskom generation mix over time, its average carbon footprint per kWh of generation is expected to drop.
Purchasing a large portion of its electricity from Khanyisa IPP could therefore ultimately increase AAP’s carbon footprint relative to buying electricity from Eskom. As a mitigating strategy different options are being evaluated to partially offset carbon emissions and bring Khanyisa IPP’s footprint in line with that of Eskom. Some of the options under consideration are CO₂ capture by algae and the use of renewables.

**Empowered entity**

It is a requirement of AAP’s mineral rights, under the Mining Charter of South Africa, that a minimum of its goods and services are procured from suppliers that are “empowered entities”. The electricity to be purchased from Khanyisa IPP through the PPA will meet this procurement requirement. In the absence of an energy charter, AAP will require the IPP to ensure that it meets mining charter procurement criteria. It is a requirement of AAP that the project company meet a minimum empowered-entity ownership of 25.1% at project company level. In addition, AAP has also set requirements for bidders regarding transformation, requirements such as local procurement and employment equity.

**Integrated Resource Plan**

When the public consultation process for the Integrated Resource Plan (IRP) was held, representation was made to ensure that projects of this nature were included in the proposed future generation mix. This would enable Khanyisa IPP to qualify to apply for a generation license. Including projects such as Khanyisa in the IRP was also important in that it linked the IPP to the total future generation mix for South Africa, and, in doing so, included the IPP into the carbon-footprint-mitigation plan for the country. South Africa has adopted targets for its future generation mix in order to mitigate its carbon footprint. The capacity allocated for coal-fired power plants in the future generation mix is limited.

**Eskom**

Electricity generated by Khanyisa IPP will be delivered to AAP’s operations by means of the national grid. As the grid is operated by Eskom, the IPP will need to enter into an agreement with Eskom to connect the power plant to the grid. This, one of two contracts, will cover connection, transmission and use of the system. A second contract involves AAP. As the platinum producer draws power from an Eskom substation, AAP will need to enter into an agreement with Eskom to use the national grid and take power off at the various designated points of delivery. This agreement with Eskom, one of own generation and use of the system, will credit AAP on the Eskom invoice with the amount of electricity that is being supplied by Khanyisa IPP. AAP will pay Eskom for the use of the network in all the power it receives. The energy component, however, will be divided in two, (1) the energy supplied by Eskom and (2) the energy supplied by Khanyisa IPP.

**Environmental impact assessment**

Before it can proceed with construction the project needs the authorization that follows an environmental impact assessment (EIA). The process can take from 18 to 24 months. In order to deliver the first unit by mid-2015, Anglo American has begun this process on behalf of the IPP. To facilitate it Anglo American provided certain technical specifications to the environmental specialists to help them in their assessment and to secure the authorization in good time. Some of the specifications include the ash transport system, design of the ash liner, emissions standards (according to the IFC), a zero-effluent plant, and air-cooled condensers.

**CONCLUSIONS**

The supply of energy in South Africa is characterized by a shortage of electricity and future increases in the price of the utility. These circumstances give investors good reason to build new power-generating capacity in the country. Anglo American has a competitive advantage over many other potential players in this market in that it has exclusive access to a fuel (discard coal) a very little cost and its operations in South African demand continuously high, stable power. Khanyisa IPP will exploit these advantages. Its location, furthermore, can take advantage of
Anglo American’s eMalahleni Water Reclamation Plant for much-needed water. The tender went public earlier this year and seven bidders have qualified: ACWA/Huadian, AES, China Guodian (GD Power), GDF Suez, JSW Energy, KEPCO and Marubeni have until January 2012 to submit priced and funded bids in accordance with pre-issued draft transaction documents. Once the bids have been evaluated and the final terms agreed upon with the selected developer, the project will need approval from the board of Anglo American. Only then, and on conclusion of the environmental and social impact assessment, the licensing process and the interconnection arrangement with Eskom, can ground breaking begin. If all goes well the first of three 150-MW CFB boilers could be commissioned in 2015.

GLOSSARY OF CONTRACTIONS

AAP     Anglo American Platinum
AATC    Anglo American Thermal Coal, a business unit of Anglo American plc
AFT     Ash-Fusion Temperature
CFB     Circulating Fluidized Bed
EBIDTA  Earnings Before Interest, Taxes, Depreciation and Amortization
EIA     Environmental Impact Assessment
FGD     Flue-Gas Desulfurization
IPP     Independent Power Producer
IRR     Internal Rate of Return
kWh     kilowatt-hour
LoM     Life of Mine
MTPPP   Medium-Term Power-Purchase Programme
NPV     Net Present Value
PPA     Power Purchase Agreement
TDS     Total Dissolved Solids

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REFERENCES